

## Ascidians from the Solomon Islands

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### ABSTRACT

Twenty-eight ascidian species from the Solomon Islands (western Pacific Ocean) are recorded including two new species (one in each of the genera *Trididemnum* and *Lissoclinium*). Extensions of the known geographic range and/or species characteristics are documented for a further 19 species (of which ten were known previously from no more than five records). Seven well known and often encountered species are newly recorded, without discussion. *In situ* colour images constitute a unique source of information on the living organisms and contribute to their recognition in the field. The species list is dominated by the Didemnidae (15 species) reflecting the diversity of that family in shallow water, reefal habitats in the tropics. Other species recorded from all suborders are also colonial, most with habits convergent with the Didemnidae.

KEYWORDS: West Pacific, tropical, Didemnidae, *in situ* images, *Trididemnum mellitum* sp. nov., *Lissoclinium karenae* sp. nov.

### INTRODUCTION

Twenty-eight ascidian species were collected by SCUBA diving from depths of four to ten metres in the Solomon Islands (Florida and Russell Groups and Guadalcanal). The specimens were all collected in June, 2004. Mature gonads and larvae were detected only in *Didemnum membranaceum*. Although a general breeding season for western Pacific tropical species has not been detected, larvae being found at all times of the year for many species (see Kott 1990, 1992, 2001), it is tempting to speculate that their absence from all but one of the present specimens coincides with the southern winter. However, there is no direct evidence of this.

With the exception only of a new species in each of the genera *Trididemnum* and *Lissoclinium*, the species recorded here are not unexpected components of the Solomon Island fauna, although ten of these species were known previously from five or fewer records. All of the species, except *Polysyncraton adelou* F. and C. Monniot, 2001 and the new species have been recorded previously from Australian waters and the material generally confirms the hypothesis that the northern Australian ascidian fauna is part of the wider western Pacific tropical fauna, sometimes extending into the tropical Indian Ocean. In a large (187 species) collection from the tropical western Pacific, F. and C. Monniot (2001) recorded 21 species of *Endistoma* (Polycitoridae), but only three species of that genus are in the present collection. Nevertheless, about 25% of the species recorded by the Monniots (*loc. cit.*) are in the Didemnidae while 50% (15 species) of the present collection are didemnids. The dominance of the latter family confirms its

high diversity in shallow water, tropical habitats. However, the large, colourful colonies occupying extensive areas are conspicuous and could cause some sampling bias.

The availability of *in situ* photographic images makes the present work a valuable illustrated catalogue to the field identification of these organisms. Some of the living specimens are seen to look dramatically different from the preserved material (e.g. *Polysyncraton cuculliferum*). Specimens examined are registered in the collection of the Queensland Museum (QM) and duplicates are in the Solomon Islands' National Museum (SINM).

### Species reported in this study

(\*records only)

#### Diazonidae

\**Rhopalaea crassa* Herdman, 1886 – QM G308764;  
SINM E004

#### Clavelinidae

*Clavelina arafurensis* Tokioka, 1952

*Clavelina oliva* Kott, 1990

\**Clavelina robusta* Kott, 1990 – QM G308761, Fig. 7C  
this work

#### Polycitoridae

*Endistoma glaucum* (Sluiter, 1909)

*Endistoma laysani* (Sluiter, 1900)

?*Endistoma inanratum* F. and C. Monniot, 2001

*Polycitor giganteus* (Herdman, 1899)

#### Didemnidae

*Leptoclinides constellatus* Kott, 2001

*Leptoclinides eriuaceus* Kott, 2001

*Polysyncraton adelou* F. and C. Monniot, 2001

*Polysyncraton cuculliferum* (Sluiter, 1909)

*Polysyncraton drouide* Kott, 2001

*Didemnum albopunctatum* Sluiter, 1909  
*Didemnum arancium* Kott, 2001  
*Didemnum lacertosum* Monniot, 1995  
*Didemnum membranaceum* Sluiter, 1909  
 \**Didemnum molle* Herdman, 1886 – QM G308769,  
 G308770; SINM E010 E011  
*Didemnum rota* Kott, 2004b  
*Trididemnum mellitum* sp. nov.  
*Lissoclitum karenae* sp. nov.  
*Lissoclitum reginum* Kott, 2001  
*Diplosoma versicolor* Monniot, 1994

#### Perophoridae

*Perophora namei* Hartmeyer and Michaelsen, 1928  
 \**Ecteinascidia nexa* Sluiter, 1904 – QM G308789;  
 Fig. 9G this work

#### Styclidae

\**Eusynstyela latericius* Sluiter, 1904 – QM G308794,  
 G308795; SINM E005 E032  
 \**Botrylloides perspicuum* Herdman, 1886 – QM  
 G308796; SINM E015; Fig. 9H

#### Pyuridae

\**Herdmania momus* (Savigny, 1816) – QM G308792

### TAXONOMY

#### Family Clavelinidae

##### *Clavelina arafurensis* Tokioka, 1952

(Figs 1A, B; 7A)

*Clavelina arafurensis* Tokioka, 1952: 97. – Kott 1990: 38 and synonymy; F. and C. Monniot 2001: 229 and synonymy.

**Distribution.** *Previously recorded* (see F. and C. Monniot 2001): Western Australia (Exmouth Gulf); Arafura Sea; Truk Atoll; Palau Islands; Philippines; Mozambique. *New record*: Solomon Islands (Russell Group, QM G308763, SINM 029).

**Description.** Living zooids have the white granular patches each side of the branchial aperture extending dorsally to surround the atrial siphon as described previously for this species. These patches are granular and white in preservative. The branchial sac is transparent with black pigment in the haemocoel and around each of the apertures. Colonies have a tough basal common test with vertical more or less cylindrical lobes, each containing up to ten completely embedded zooids.

Zooids have about 15 rows of branchial stigmata. In these specimens about 8 transverse muscles extend from the endostyle across the thorax where they merge with longitudinal bands from the branchial and atrial siphons and extend along each side of the abdomen, terminating posteriorly in the two horns, one each side of the vascular stolon. The stomach is about halfway down the relatively short abdomen.

Larvae are in the posterior part of the atrial cavity. The larval trunk is 0.62 mm long and the tail is wound almost three-quarters of the way around it.

**Remarks.** F. and C. Monniot (2001) have referred to partially embedded zooids, although in all other reported specimens, the zooids are entirely embedded in the separate lobes of the colonies. Also, as in most species in this genus, there are muscles emanating from the endostyle and curving to form the longitudinal bands from the branchial and atrial siphon. A specimen from the Philippines (F. and C. Monniot 2001: fig. 22) is a strongly contracted specimen in which the endostylar muscles appear to have become isolated from a band of dorsal longitudinal muscles. Apart from its strongly contracted condition, the musculature is not essentially different from that of other clavelinid zooids.

Larvae have not previously been reported for this species. They are distinctive in the absence of a frontal plate and in their simple concave triradially arranged adhesive organs that resemble those of the temperate *Clavelina bandinensis* Kott, 1957. The latter species is similar to the present one in its embedded zooids and branched colony, although its zooid pigmentation is quite different and it lacks the endostylar muscles of other present species.

##### *Clavelina oliva* Kott, 1990

(Figs 2; 7B)

*Clavelina oliva* Kott, 1990: 55. – Kott 2002: 22.

**Distribution.** *Previously recorded* (see Kott 1990, 2002): Western Australia (Dampier Archipelago, Kendrew Island, Shark Bay, Houtman's Abrolhos); Queensland (Lindeman Island, Lizard Island); Northern Territory (Darwin); Philippines. *New record*: Solomon Islands (Florida Group, QM G308762, SINM E025).

**Description.** In life the small zooids have white thoraces with a blue band around the apertures and a blue abdomen showing clearly through the translucent, colourless test. Zooids appear to be solitary, the thoraces supported on a relatively narrow stalk containing the abdomen and the posterior abdominal vascular stolon. The stalk expands basally into thicker test by which it is attached to the substrate. The expanded base contains the terminal ampullae which detach from the vascular stolon and develop into replicates of the zooids. The separately opening apertures have smooth rims. About 10 rows of stigmata are in the branchial sac. The gut loop is short, the stomach about halfway down it, with a short duodenal area opening into a rounded posterior stomach. A short length of the cylindrical intestine is in the pole of the gut loop. The stomach is symmetrical, and its otherwise smooth wall is divided into four more or less equal longitudinal areas by straight narrow strips of what appears to be glandular epithelium that extend the full length of the stomach. Gonads are enclosed in the short gut loop.

**Remarks.** The small separate zooids, relatively short gut loop and long vascular stolon with numerous ectodermal terminal ampullae in the base are characteristic of the species. The symmetrical stomach, with a smooth wall interrupted by four straight strips of glandular



cells, which create the characteristic square shape that Berrill (1950) refers to, appears to be characteristic of the Clavelinidae.

**Family Polycitoridae**

*Polycitor giganteus* (Herdman, 1899)

(Fig. 7D)

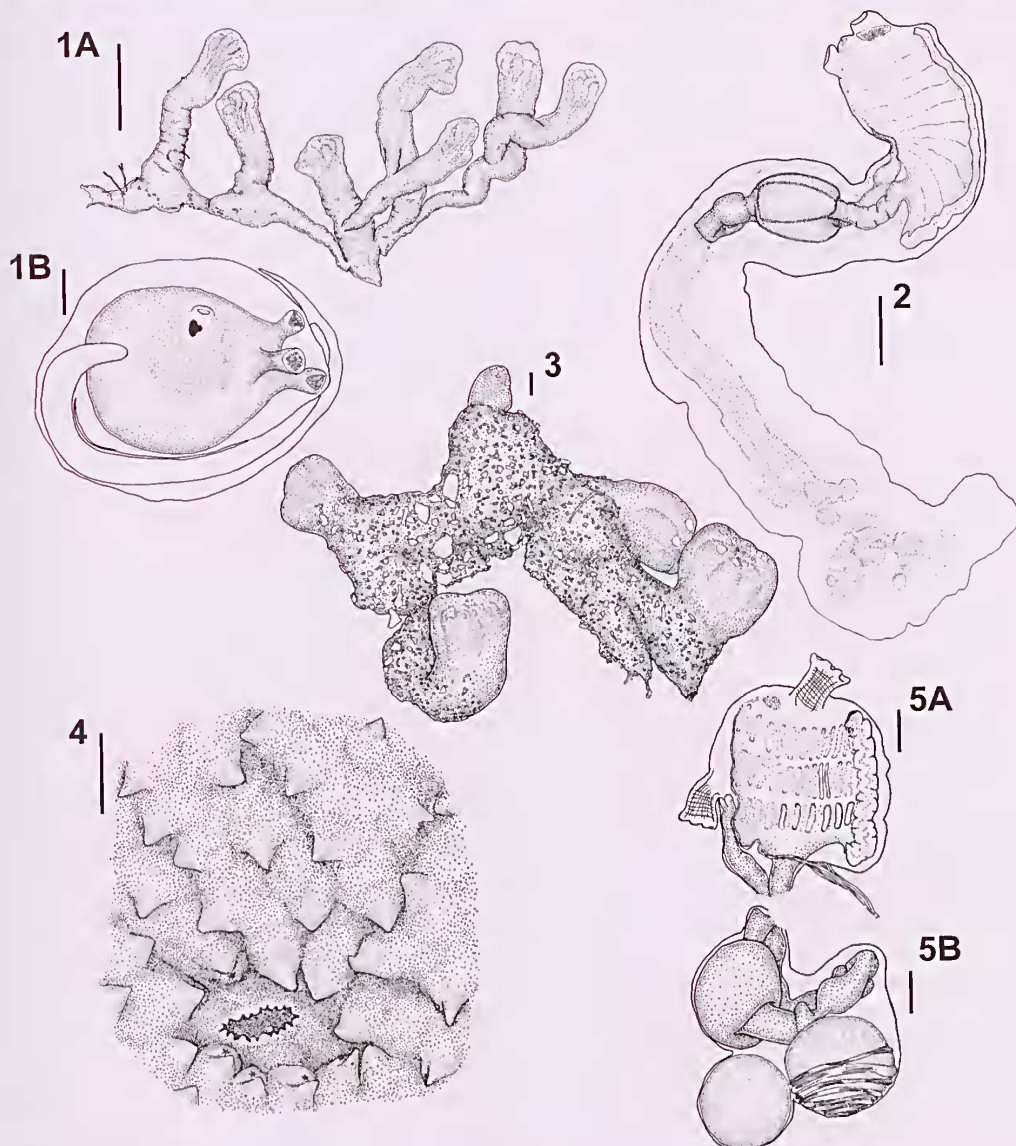
*Polyclinum giganteus* Herdman, 1899: 79.

*Polycitor giganteus*. – Kott 1990: 171 and synonymy; F. and C. Monniot 2001: 249.

**Distribution.** *Previously recorded* (see Kott 1990, F. and C. Monniot 2001): the species is recorded from

locations all around Australia. Kott (2001) thought it was an indigenous species although records from Papua New Guinea (F. and C. Monniot 2001) and the newly recorded colony from the Florida Group (QM G308790, SINM E009) indicate that the species does have a wider range into the West Pacific. The type location is Port Jackson (not South Australia as in F. and C. Monniot 2001).

**Remarks.** Three large, firm, gelatinous species are known in this genus, viz. *Polycitor circes* Michaelsen, 1930, *P. giganteus* and *P. translucidus* Kott, 1957. They all have long thoraces with numerous stigmata and their



Figs 1–5. 1, *Clavelina arafurensis* (QM G308763): A, colony; B, larva; 2, *Clavelina oliva* (QM G308762), zooid; 3, *Eudistoma laysani* (QM G308798), colony; 4, *Polysyncraton cuculliferum* (QM G308780), surface of part of colony showing a common cloacal aperture; 5, *Trididemnum mellitum* (QM G308776, holotype): A, thorax; B, abdomen. Scale bars: 1A, 1.0 cm; 1B, 5A, B, 0.1 mm; 2, 3, 4, 1.0 mm.

long zooids have separately opening apertures and are not arranged in circles or rudimentary systems as so often they are in species in the Polycitoridae.

*Polycitor circes* is recorded from the northern half of the Australian continent, Papua New Guinea, New Caledonia and the Philippines. The type location, said to be 'Australia' in F. and C. Monniot (2001), is Cockburn Sound on the central coast of western Australia. It has large larvae with triradially arranged adhesive organs, fine longitudinal stomach folds and black pigment in the zooids. *Polycitor translucidus* also is recorded from the Philippines, New Caledonia, French Polynesia and the northern half of the Australian continent, and it penetrates south to Cockburn Sound on the western coast of the continent and to Port Jackson and Wilson's Promontory (Victoria) on the eastern coast. It has a transparent (rather than translucent) test, a stomach like the present species that has over four longitudinal folds, and small larvae (to 0.08 mm) with antero-median adhesive organs.

*Polycitor giganteus* has a translucent test, a larva about 1.25 mm long with antero-median adhesive organs, and the stomach has four longitudinal grooves. It is distinguished from *P. translucidus* by its translucent test and longer larva; and from *P. circes* by its stomach, lack of black pigment and the vertical arrangement of the antero-median adhesive organs.

#### *Endistoma glaucum* (Sluiter, 1909)

(Fig. 7E)

*Polycitor glaucum* Sluiter, 1909: 12.

*Endistoma glaucum*. – Kott 1990: 208 and synonymy; ?F. and C. Monniot 2001: 240.

?*Endistoma viride*. – F. and C. Monniot 2001: 247.

**Distribution.** *Previously recorded* (see Kott 1990): Queensland Great Barrier Reef; Palau Islands, Okinawa, Indonesia, Fiji. *New records*: Solomon Islands (Florida Group, QM G308773, SINM E008).

**Remarks.** The colony, consisting of firm, darkly pigmented, rounded heads on short stalks, with separately opening zooids arranged in circles, is characteristic of this species, as are the zooids with their long oesophageal necks. The white patches in the photographed specimen are small didemnid colonies.

Tokioka (1955) compared this species with *Endistoma viride* Tokioka, 1955, a junior synonym of *Sigillina signifera* (Sluiter, 1909), which has flat-topped colonies with dark bluish-green zooids (see Kott 1990). F. and C. Monniot (2001) assigned specimens with a long oesophageal neck to Tokioka's species, despite the fact that the latter has shorter zooids with the pronounced muscular posterior abdominal stolon of *Sigillina* and the greenish-black colour of the preserved zooids of *S. signifera*. *Endistoma viride* of F. and C. Monniot (2001) has a long oesophageal neck and a number of embryos being incubated in the branchial sac (rather than the single large embryo of *Sigillina signifera*, which is being incubated in a brood pouch constricted off from the thorax), and it may be a synonym of the present species.

*Endistoma glaucum* of F. and C. Monniot (2001) is recorded from Papua New Guinea but is not described and its identity is not confirmed.

#### *Endistoma laysani* (Sluiter, 1900)

(Fig. 3; 7F)

*Distoma laysani* Sluiter, 1900: 9.

*Endistoma laysani*. – Monniot 1988: 212 and synonymy; Kott 1990: 214 and synonymy.

**Distribution.** *Previously recorded* (see Monniot 1988, Kott 1990): New South Wales (Botany Bay, Lake Macquarie); Queensland (NSW-Queensland border, Noosa, Gladstone, Heron Island, Sarina); Lord Howe Island; New Caledonia, Palau Islands, ?Philippines, French Polynesia, Hawaii. *New records*: Solomon Islands (Russell Group, QM G308798-9, SINM E014, E022).

**Description.** Small, well-spaced, stalked, flat-topped vertical lobes arise from a sandy common basal mat. There is only a sprinkling of sand on the vertical lobes. Zooids are in circles of up to eight around the top of the lobes, their atrial apertures opening toward the centre of the upper surface. In life, the lobes are white and translucent with a conspicuous narrow black line around each aperture joined by a straight median line between the two apertures. In preservative, the zooids are pinkish-white, but the black line is not present. Zooids are small and very contracted in the newly recorded specimens. They have the usual strong transverse muscles and longitudinal bands, three rows of stigmata, long oesophageal neck, and gonads in the pole of the gut loop.

**Remarks.** Zooids of the genus *Endistoma* have a conservative morphology, and often the species are determined on the form of the colony (including the arrangement of zooids and their organisation into rudimentary cloacal systems), the nature of test inclusions and the form of the larvae. The present species, with its small, naked, vertical lobes on a common sandy base, is especially difficult to characterise and it is probable that specimens with a similar conservative morphology have been occasionally assigned erroneously to this taxon.

Tokioka (1967) describes a large colony (from the Palau Islands) consisting of 13 vertical lobes. The zooids conform to those generally found in this genus. Their arrangement in the vertical lobes is not documented and their larvae have a trunk about 1.0 mm long. Kott (1990) did not regard these specimens as synonyms of the present species.

Millar (1975) recorded similar colonies from the Philippines and Indonesia, although he found the zooids arranged in circular systems with atrial apertures in the centre of the lobe. Larvae in Millar's (1975) specimen have a trunk of 0.54 mm long, similar to those recorded by Kott (1990) from a range of locations but about half the length reported by Tokioka (1967).

Kott (1990) did not observe circular systems in a range of colony forms, from those with many small vertical lobes with relatively few zooids, to single lobes with many zooids. She may have overlooked these systems in the



preserved material. Nevertheless, it is possible that not all of the range of different colonies Kott (1990) assigned to this species are conspecific. *Eudistoma album* Monniot, 1988 from Tonga, New Caledonia and the Marianas Islands has similar zooids and similar (but smaller) larvae. However, it has cushion-like colonies rather than the small vertical lobes of the present species, and some specimens of *E. laysani* of Kott (1990) may belong to this species.

*Eudistoma laysani* of Millar (1975) from the Philippines has similar colonies to the present species and single systems in each lobe. However, it has yellow pigment spots each side of the dorsal ganglion, and may be conspecific with *E. punctatum* F. and C. Monniot, 2001, which also has a prominent orange/red spot on each side of the dorsal ganglion.

Nevertheless *E. laysani* (Sluiter, 1900) has a wide range in the tropical Pacific. It is characterised by its colonies consisting of a sandy basal mat and vertical zooid-bearing lobes with rudimentary cloacal systems opening on the top of each lobe and a larval trunk 0.4–0.5 mm long with four median ampullae alternating with the antero-median adhesive organs.

The black lines around the apertures and connecting them in the mid-dorsal line (observed in the *in situ* photographs of the newly recorded colonies) are recorded here for the first time.

*Eudistoma laysani* of F. and C. Monniot (2001) from Papua New Guinea is a new record, but is not described and the identification is not confirmed.

**?*Eudistoma inauratum* F. and C. Monniot, 2001**

(Fig. 7G)

**Distribution.** *Previously recorded* (see F. and C. Monniot 2001): Palau Islands. *New record*: Solomon Islands (Russell Group, QM G308800, SINM E021).

**Description.** In life, the colonies are small, upright translucent yellowish spherical heads on a short, cylindrical sandy stalk. Sand is not present in the upper part of the colony. Zooids open separately on the spherical head. They do not appear to be in circles. In the preserved colonies, the zooids are very contracted and their morphology could not be determined.

**Remarks.** The newly recorded colonies resemble those of *E. inauratum*, although they are translucent yellow rather than orange. Detail of the zooid structure is obscured by contraction.

***Leptocliuoides constellatus* Kott, 2001**

(Fig. 7H)

*Leptocliuoides constellatus* Kott, 2001: 51. – Kott 2004b: 49 and synonymy.

**Distribution.** *Previously recorded* (see Kott 2004b): Queensland (Whitsunday Islands); Northern Territory (Darwin, Bynoe Harbour). *New record*: Solomon Islands (Florida Group, QM G308774, SINM E016).

**Description.** The newly recorded colony is a robust slab with black pigment cells crowded into bands in the roof of common cloacal canals to form wide, black lattice-like markings on the surface. Well-spaced branchial apertures are along each side of the common cloacal canals. Patches of beige/tan are also present in the surface of the living colony.

The conspicuous superficial layer of bladder cells overlies the spicules, which are in the upper half of the colony surrounding the common cloacal cavities and in the zooid-free areas between and surrounded by the common cloacal canals. Spicules also are in a thin layer on the base of the colony. Spicules are stellate to 0.075 mm diameter with 9–11 chisel-tipped rays in optical transverse section. The lower half of the colony is transparent and aspiculate. Black, granular, spherical bodies are scattered through the test.

**Remarks.** Although neither the black streaks in the surface nor the black pigment cells were detected in the type material, the aspiculate basal test and the shape and form of the relatively small spicules help to distinguish the species.

***Leptocliuoides eriuaceus* Kott, 2001**

(Figs 6A, 8A)

*Leptocliuoides eriuaceus* Kott, 2001: 61.

**Distribution.** *Previously recorded* (see Kott 2001): Western Australia (NNW of Port Hedland), Queensland (Hardy Reef). *New record*: Solomon Islands (Florida Group, QM G308768, SINM E001).

**Description.** This fleshy looking slab has an aspiculate superficial layer of test that is particularly conspicuous as brownish marks where the surface is depressed over the radial canals that converge to the randomly spaced, large, sessile, common cloacal apertures, which have either blackish or transparent rims. The colour in life is pink over the common cloacal canals with the branchial apertures showing as conspicuous black dots suggesting that the zooids are black in life.

Spicules are in thin layers, one beneath the bladder cell layer and another in the base of the colony, and the remainder of the colony is aspiculate. Spicules are large (to 0.125 mm), stellate (with 13–15 and sometimes 11 conical rays in optical transverse section) with pointed or chisel-shaped tips.

The zooids are of the usual form for this genus, with a posteriorly orientated atrial siphon.

**Remarks.** This species has the same number of spicule rays as the temperate species *L. magnistellus*, but they are smaller. Further, the surface of *L. magnistellus* is raspy to the touch and lacks the layer of bladder cells found in the present species. The spicules are identical to those previously described, although some have only 11 rays in optical transverse section.

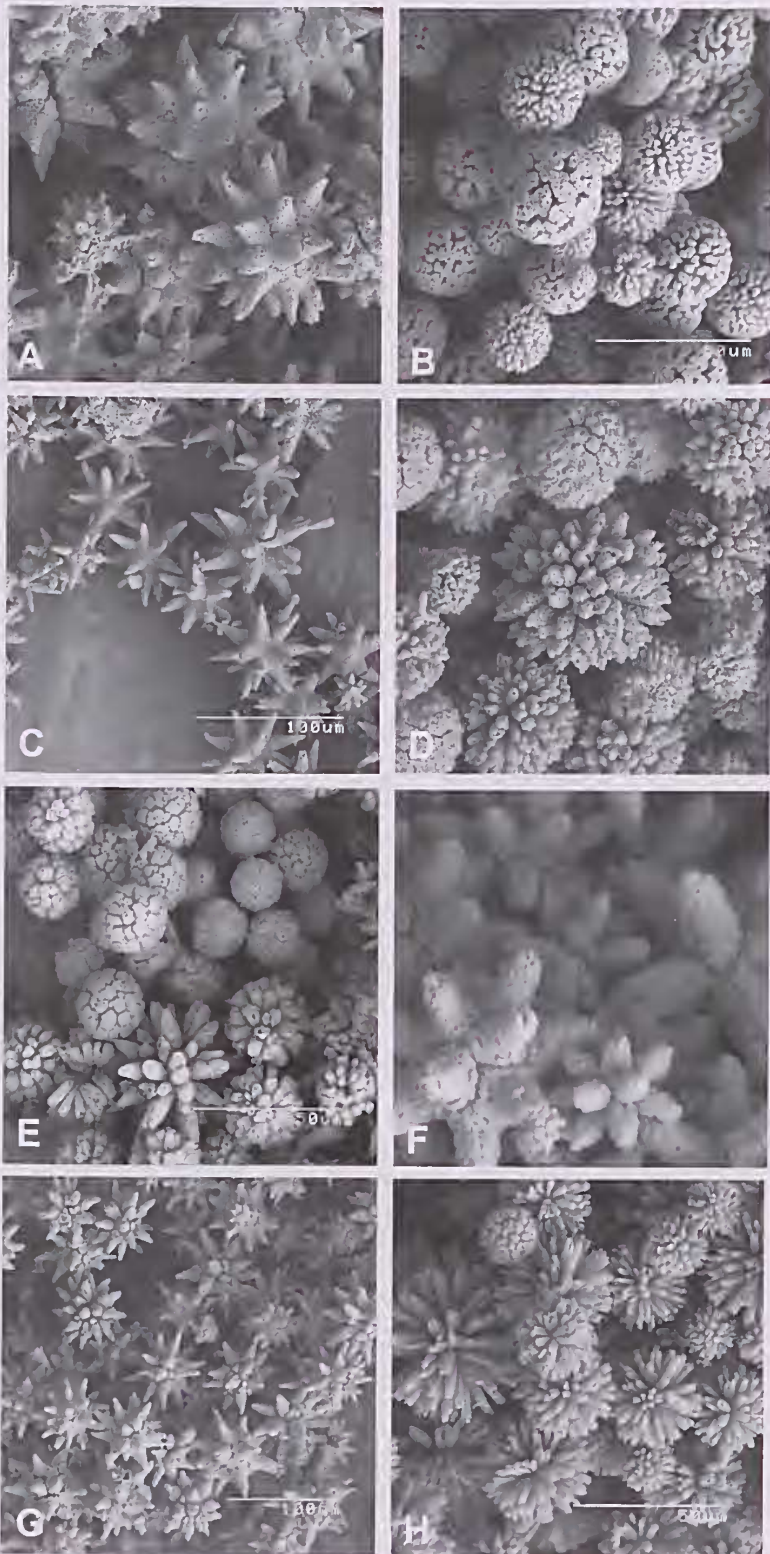


Fig. 6. Scanning electron micrographs of calcareous spicules from the test of: A, *Leptoclinides erinaceus* (QM G308768); B, *Polysyncraton adelon* (QM G308779); C, *Polysyncraton cuculliferum* (QM G308780); D, *Didemnum arancium* (QM G308777); E, *Didemnum lacertosum* (QM G308771); F, *Didemnum rota* (QM G308783); G, *Trididemnum mellinum* (QM G308776, holotype); H, *Lissoclinium karenac* (QM G308781, holotype).



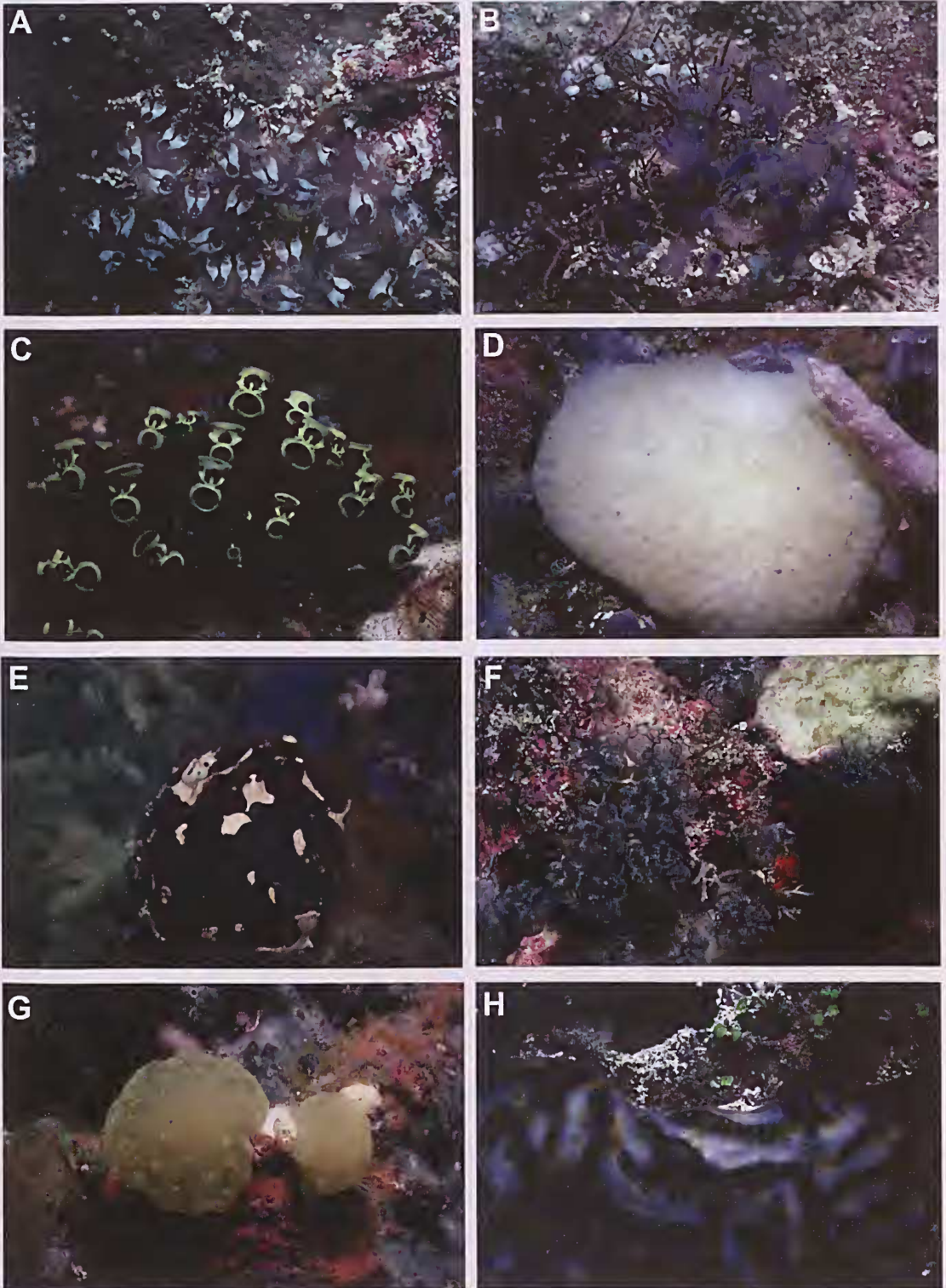


Fig. 7. *In situ* images: A, *Clavelina arafurensis* (QM G308763); B, *Clavelina oliva* (QM G308762); C, *Clavelina robusta* (QM G308761); D, *Polycitor giganteus* (QM G308790); E, *Endistoma glaucum* (QM G308773); F, ?*Endistoma laysani* (QM G308799); G, ?*Endistoma inauratum* (QM G308800); H, *Leptoclinides constellatus* (QM G308774).

***Polysyncraton adelon* F. and C. Monniot, 2001**

(Figs 6B, 8B)

*Polysyncraton adelon* F. and C. Monniot, 2001: 272.**Distribution.** *Previously recorded* (see F. and C. Monniot 2001): Palau Islands. *New records*: Solomon Islands (Russell Group, QM G308778-9, SINM E019-20).**Description.** The newly recorded specimen is a stiff, hard, thin, encrusting sheet, greenish-black in preservative. Black/green cells are mixed with the bladder cells in a thin superficial layer of test and black cells are scattered sparsely through the remainder of the test amongst the white spicules. Spicules are globular, to 0.05 mm diameter, with relatively crowded flat-tipped, rod-like rays. In life the colony is red with white on the base and around the sides.

Zooids are blackish-green, with a fine retractor from halfway down the oesophageal neck.

**Remarks.** The thin colonics, globular spicules to 0.05 mm diameter and the greenish colour of the zooids appear to be characteristic of this readily identified species. In their variable size these globular spicules resemble those of *Lissoclinum patella*, although the species differ from one another in other respects, including their generic characters.***Polysyncraton cuculliferum* (Sluiter, 1909)**

(Figs 4, 6C, 8C)

*Diplosomoides cuculliferum* Sluiter, 1909: 90.*Polysyncraton cuculliferum*. – Kott 2002: 30; Kott 2005: 2427 and synonymy.**Distribution.** *Previously recorded* (see Kott 2005): Northern Territory (Darwin, Bynoe Harbour). Queensland (Great Barrier Reef, Whitsunday Islands, Hinchinbrook Island, Lizard Island); Indonesia. *New record*: Solomon Islands (Russell Group, QM G308780).**Description.** The colony is a double cone with one large terminal common cloacal aperture on one of the cones, and another between the two cones. Both the common cloacal apertures are sessile with spicules in the rim of the opening. Branchial apertures are at the base of, and partially covered by, conspicuous pointed papillae which are directed toward the common cloacal apertures. In life the soft, green colony with its conspicuous surface papillae has a dramatic and unique appearance.

Spicules are present in a thin layer in the surface test but are sparse elsewhere. They are stellate with 7–9 long, tapered and sharply pointed rays and are up to 0.86 mm diameter. The common cloacal cavity is vast and extends from a horizontal space posterior to the zooids that separates the surface zooid-bearing layer of test from the basal or central test. The posterior abdominal cavity is crossed by connectives between the basal or central test and the surface zooid-bearing layer of test and it opens into a large open space beneath the common cloacal apertures.

Zooids are robust. The ventral branchial lobe is enlarged and projects into the surface papillum. A wide

atrial aperture with a small atrial lip from its anterior rim exposes the branchial sac to the common cloacal cavity. A retractor muscle was not detected in this specimen. Oesophageal buds are present.

Up to 6 or 7 immature testis follicles were detected in some of the zooids.

**Remarks.** The colony shape and texture of the newly recorded specimen resembles *Didemnum molle* (Herdman, 1886), however the surface papillae and the translucent green colour are both different from *D. molle* which is smooth and opaque, its green colour deriving from its symbiotic green symbionts. Also the distinctive stellate spicules of the present species are readily distinguished from the globular spicules of *D. molle*. Specimens from Darwin Harbour (see Kott 2002, 2004a) are similar in appearance to the newly recorded specimen, although some specimens of the junior synonym, *P. echinatum* Kott, 2001 from north-eastern Queensland, are larger colonies and the one from Bowden Reef (Kott 2001: pl. 5A) appears to be a different colour.***Polysyncraton dromide* Kott, 2001**

(Fig. 8D)

*Polysyncraton dromide* Kott, 2001: 49. – Kott 2002: 32; Kott 2004a: 2477.**Distribution.** *Previously recorded* (see Kott 2004a): northern Australia (Torres Strait, Darwin); Western Australia (Cockburn Sound). *New record*: Solomon Islands (Florida Group, QM G308772, SINM E007).**Description.** The colony is aspiculate, and forms an irregular, brown, encrusting sheet with what appear as a mosaic of brown blisters over the surface. These blisters are separated by narrow depressions of the surface test over the circular common cloacal canals. The zooids line the common cloacal canals, their branchial apertures being along each side of these depressions, and their broad atrial lips fan out across the roof of the common cloacal canals. Abdomina are embedded in the test. Zooids have a long fine retractor muscle.**Remarks.** The common cloacal systems, consisting of circular canals lined on each side by the zooids, surrounding firm stands of test that project like blisters on the surface of the colony, occur in *Polysyncraton arvum* Kott, 2004b and *P. catillum* Kott, 2004a (from Ashmore Reef), *P. palliolum* Kott, 2001 (from Rottneest Island, Western Australia), *P. pseudorugosum* Monniot, 1993 (from central Queensland, Darwin, the Northern Territory and the Coral Sea), *P. purou* C. and F. Monniot, 1987 (from the Great Barrier Reef, Darwin, the Philippines and French Polynesia), and *P. robustum* Kott, 2001 (from Cockburn Sound, Western Australia). Of these, *P. purou* (which is more darkly pigmented than the present species) is the only other species that is aspiculate.

The present aspiculate specimen, like one from Darwin (see Kott 2004a), differs from the type material in lacking the burr-like spicules either scattered sparsely



in the surface test or crowded in the test over the common cloacal canals.

In life the present specimen looks browner than previously photographed specimens, but it has the same metallic sheen in the surface (see Kott 2002: fig. 24g) and the specimens are otherwise identical.

***Didemnum albopunctatum* Sluiter, 1909**

(Fig. 8E)

*Didemnum albopunctatum* Sluiter, 1909: 148. – Kott, 2004b: 52 and synonymy.

**Distribution.** *Previously recorded* (see Kott 2004b): Western Australia (Ashmore Reef, Rowley Shoals, Houtmans Abrolhos); Queensland (Great Barrier Reef); Indonesia; Indian Ocean (Cocos Keeling). *New record*: Solomon Islands (Florida Group, QM G308775, SINM E012).

**Description.** The colony is a soft, encrusting sheet with black pigment cells in a superficial bladder cell layer, and spherical black pigment cells mixed with crowded spicules fill the remainder of the colony. The soft, flexible rather than brittle colony may be the result of the small (to 0.038 mm diameter) globular spicules with flat-tipped crowded rays. In life, a ring of black pigment in the bladder cell layer sometimes surrounds each branchial aperture, although this often is absent and white patches surround the apertures. The horizontal common cloacal cavity is at thorax level and is crossed by the thoracic part of the zooids, each with a strip of test along the ventrum. Abdomina are embedded in the white (with crowded spicules) basal test where the pigment cells are only sparse.

Zooids have a short retractor muscle from a short distance down the oesophageal neck.

**Remarks.** This species has a characteristic aspiculate surface layer of test. Relatively few species in this genus have globular spicules like those in the present species. They are present in *D. precocinum* Kott, 2001, which is distinguished by its deeper common cloacal cavity and the absence of a black bladder cell layer. *Didemnum jedanense* Sluiter, 1909 has similar-sized spicules but they have irregular ray tips, the zooids are along each side of circular canals and spicules usually are less crowded and are missing from many parts of the colony.

***Didemnum arancium* Kott, 2001**

(Figs 6D, 8F)

*Didemnum arancium* Kott, 2001: 150 and synonymy.

**Distribution.** *Previously recorded* (see Kott 2001): Queensland (southern Great Barrier Reef); French Polynesia. *New records*: Solomon Islands (Russell Group, QM G308777, SINM E018).

**Description.** The colony is a hard white slab in preservative, and looks the same in life. Spicules, crowded throughout, are burr-shaped to globular, the latter with tiny, short conical points in the flat ends of the rod-like rays.

**Remarks.** The material recorded from Australia (including the type colonies) are salmon-coloured to

orange vermilion, or a deep orange colour. Despite the white colour of the newly recorded colonies, they are otherwise the same as previously recorded colonies. The spicules of this species are unique.

***Didemnum lacertosum* Monniot, 1995**

(Figs 6E, 8G)

*Didemnum lacertosum* Monniot, 1995: 311. – Kott 2001: 199.

**Distribution.** *Previously recorded* (see Kott 2001): Queensland (southern Great Barrier Reef); New Caledonia. *New record*: Solomon Islands (Florida Group, QM G308771).

**Description.** In preservative, the newly recorded colony is a white cushion, with three or four large common cloacal apertures around the outer margin. Spicules, up to 0.05 mm diameter, are crowded throughout the colony. They are globular and burr-shaped (both with crowded rod-shaped flat-tipped rays), and stellate (with up to 19 crowded fusiform rays in optical transverse section). Gonads were not detected in the colony.

**Remarks.** The species is readily identified by its polymorphic spicules that resemble those in *Didemnum moseleyi* (Herdman, 1886) and *D. poecilomorpha* F. and C. Monniot, 1996 (with symbiotic plant cells in the colony), which are the same size but have fewer rays. *Didemnum vesperi* Kott, 2004b also has similar spicules to the present species but the stellate spicules have shorter rays and the species has characteristic small colonies with a central common cloacal aperture.

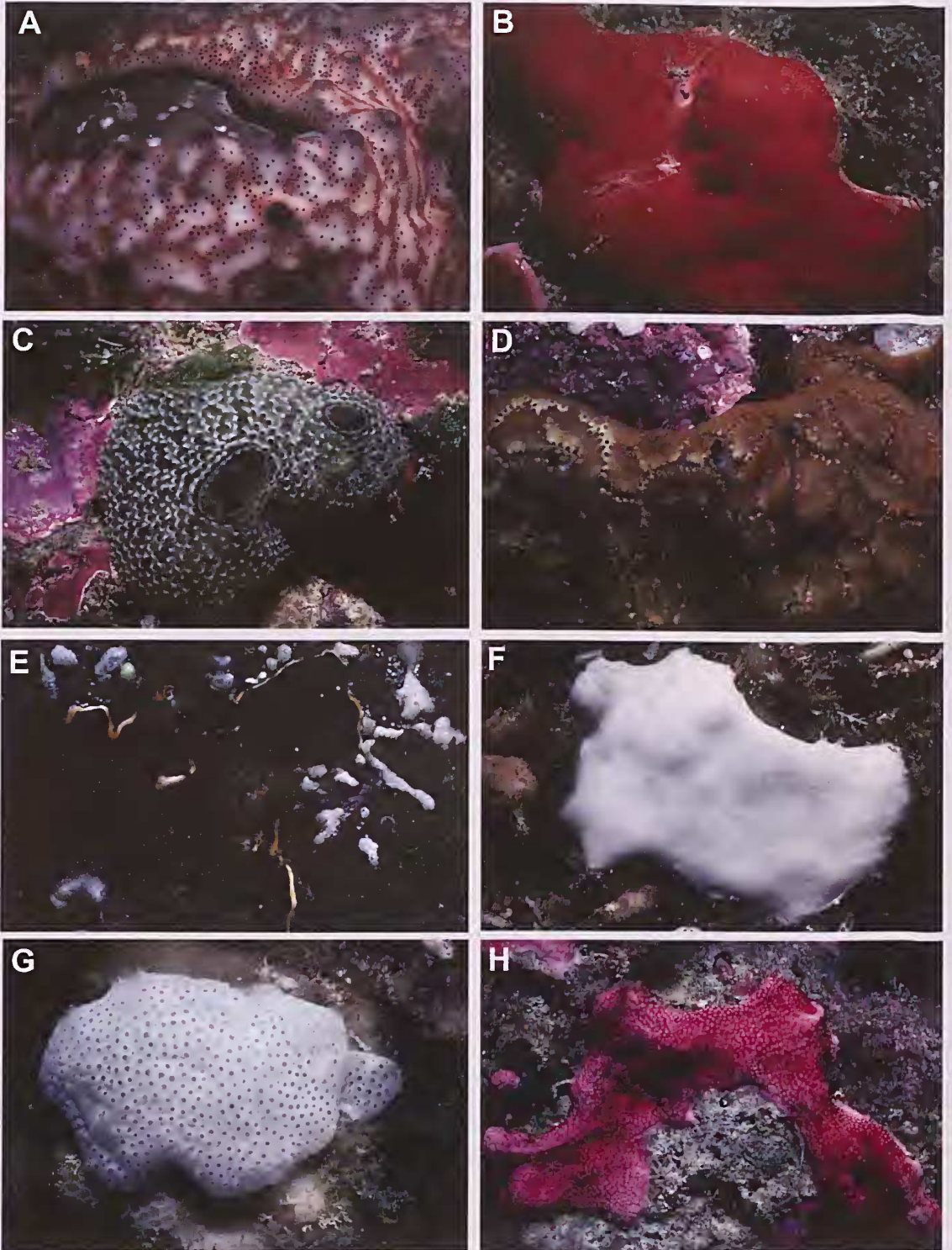
***Didemnum membranaceum* Sluiter, 1909**

(Fig. 8H)

*Didemnum membranaceum* Sluiter, 1909: 58. – Kott 2004a: 2497 and synonymy; Kott 2004b: 56.

**Distribution:** *Previously recorded* (see Kott 2004a,b): Western Australia (Montebello Island to Dongara, Marmion Lagoon, Cockburn Sound); South Australia (Kangaroo Island, SAM); Queensland (Moreton Bay, Heron Island, Swain Reefs, Broadhurst Reef, Fantome Island, Davies Reef); Northern Territory (Darwin); Timor Sea, Indonesia, Micronesia, French Polynesia, Hong Kong. *New record*: Solomon Islands (Florida Group, QM G308782, SINM E024).

**Description.** In preservative, the newly recorded colony is a white cushion with the usual superficial dirty brown marks resulting from the brown pigment cells in the thin superficial test amongst the small pointed papillae that are often on the surface of colonies of this species. The crowded spicules are characteristic with relatively rare giant stellate spicules with few rays scattered amongst the ordinary stellate spicules with pointed conical rays. The horizontal common cloacal cavity with thoraces crossing it separately, each associated with a ventral strip of test is also characteristic as are the small comma-shaped zooids with a fine retractor muscle from halfway down the oesophageal neck and about six stigmata in the anterior row on one



**Fig. 8.** *In situ* images: A, *Leptoclinides erinaceus* (QM G308768); B, *Polysyncraton adelon* (QM G308778); C, *Polysyncraton cuculliferum* (QM G308780); D, *Polysyncraton dromide* (QM G308772); E, *Didemnum albopunctatum* (QM G308775); F, *Didemnum arancium* (QM G308777); G, *Didemnum lacertosum* (QM G308771); H, *Didemnum membranaceum* (QM G308782).



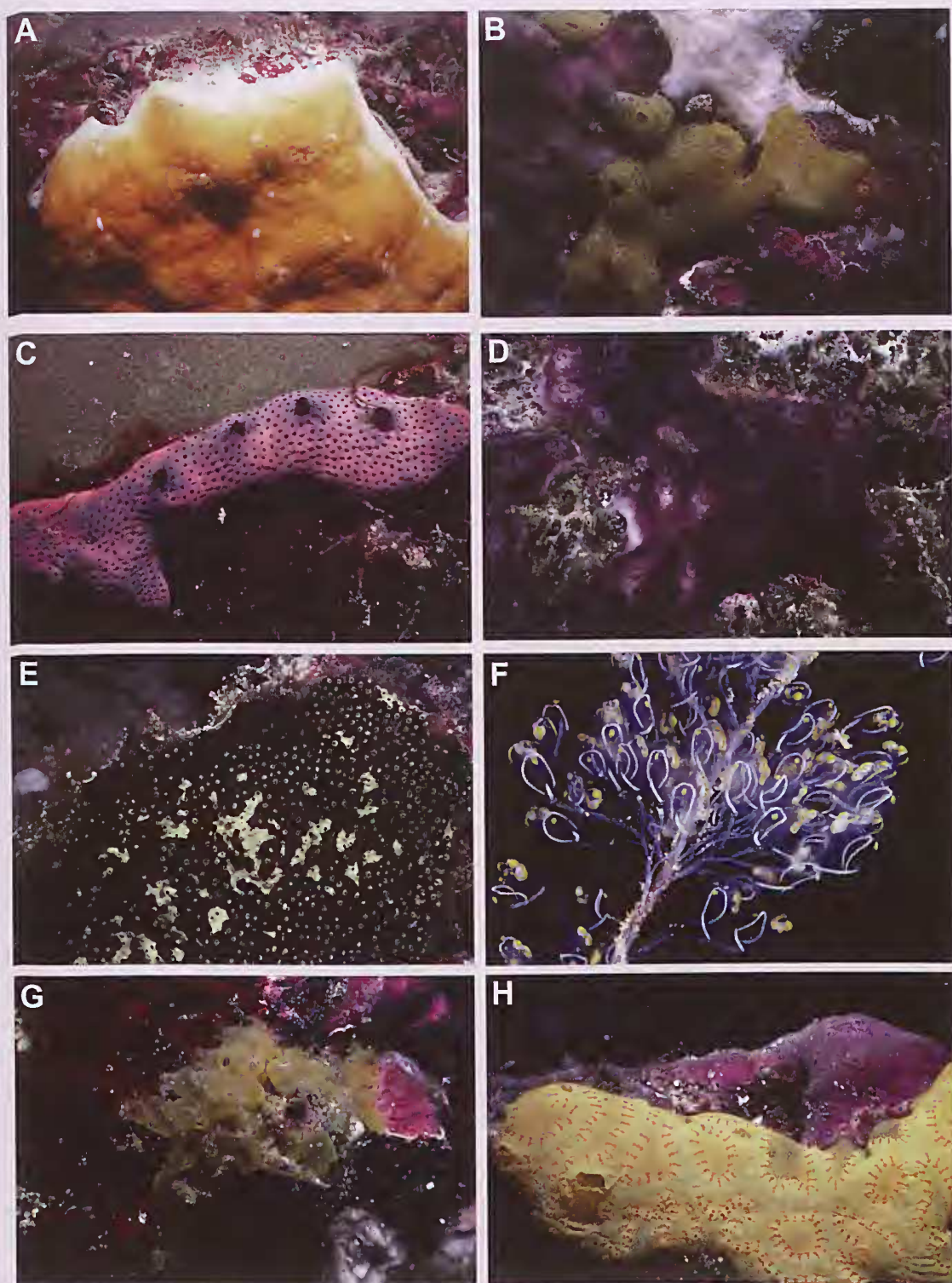


Fig. 9. *In situ* images: A, *Didemnum rota* (QM G308783); B, *Trididemnum mellitum* (QM G308776, holotype); C, *Lissoclinum karenae* (QM G308781, holotype); D, *Lissoclinum reginum* (QM G308784); E, *Diplosoma versicolor* (QM G308785); F, *Perophora namei* (QM G308787); G, *Ecteinascidia nexa* (QM G308789); H, *Botrylloides perspicuum* (QM G308796).

side of the branchial sac. Larvae are in the basal test of the newly recorded colony and are of the usual form with four pairs of ectodermal ampullae.

**Remarks.** This is one of the most commonly recorded species in the shallow water ascidian fauna of the tropical western Pacific. Although generally its morphology is conservative and resembles many other *Didemnum* spp., it is readily identified by the giant spicules that occur amongst its otherwise unremarkable stellate spicules. The species also has a remarkable range around the Australian coast and supports the hypothesis that the continental shelf constitutes a bridge for species between the tropics and temperate waters (see Kott 1985).

***Didemnum rota* Kott, 2004**

(Figs 6F; 9A)

*Didemnum rota* Kott, 2004b: 58.

**Distribution.** *Previously recorded* (see Kott 2004b): Ashmore Reef. *New record*: Solomon Islands (Russell Group, QM G308783, SINM E031).

**Description.** In preservative, the newly recorded colonies are flat, hard, off-white sheets. The basal surface is white and wrinkled, possibly resulting from its removal from the substrate. The upper surface is yellowish and dimpled where the branchial apertures are withdrawn into the surface. The superficial test has a slightly fluffy look as if the otherwise crowded spicules are mixed with bladder cells. In life the colony appears to be a deeper yellow colour on the surface shading into a yellowish-red around the common cloacal apertures. Spicules (to 0.062 mm diameter) are stellate with 7–9 almost cylindrical rays in optical transverse section. The ray tips are relatively blunt. A thoracic cloacal cavity is shallow and horizontal and is crossed by the relatively robust thoraxes with moderately long branchial siphons. The atrial aperture is sessile and lacks an anterior lip. A retractor muscle projects from about halfway down the oesophageal neck. Gonads were not detected.

**Remarks.** Although the present colony is yellow in life, while the holotype of *D. rota* is brick-red (see Kott 2004b), the colonies appear to be similar and some traces of the red pigment are in the surface of the newly recorded specimen. Most aspects of the zooids and the spicules appear to be the same in these specimens. Spicules are similar though smaller and with longer, thinner rays than those of *D. lillipution* Kott, 2004b, which also is recorded from Ashmore Reef. However the colonies of *D. lillipution* are colourless, and thin and brittle, and its zooids are larger and less robust than those of the present species.

***Trididemnum mellittum* sp. nov.**

(Figs 5A,B; 6G; 9B)

*Trididemnum savignii*. – Kott 2004a: 2505.

**Distribution.** *Type locality*: Solomon Islands (Florida Group, Nggele Sule off Uru Point, 09°01.4'S 160°06.69'E, 4–6m, coll. K. Gowllett-Holmes 23 June 2004, holotype

QM G308776; paratype SINM E013). *Previously recorded*: Northern Territory (Darwin Harbour, Kott 2004a, QM G308618, G308626).

**Description.** The holotype colony is a thin cushion to 2 cm diameter, although an *in situ* photograph shows a translucent yellow, irregular cushion. The colony is a pinkish colour in preservative with short, upright, almost cylindrical lobes on the upper surface. Large terminal common cloacal apertures are on the upright lobes of the colony.

Large spicules (to 0.1 mm diameter) are evenly distributed (but not crowded) in a layer beneath an aspiculate surface layer of bladder cells. Spicules are sparse in the remainder of the test. They are stellate with 11–13 spiky rays in optical transverse section. Flat-topped stubs sometimes are crowded between the base of the rays where, possibly, their conical tips have broken off. The common cloacal cavity is extensive and zooids are suspended across it in test connectives that join the surface to the basal layer of test. A layer of faecal pellets is embedded in the basal test.

Zooids are relatively small, with a conspicuous branchial siphon and posteriorly orientated atrial siphon, each with six very similar rounded lobes on the rim of the opening. An endostylar pigment cap was detected over the anterior end of the endostyle and the abdomen of the preserved zooids is covered with black squamous epithelium. Fine, parallel, longitudinal muscles are on the thorax and a short, thick retractor muscle extends from the posterior end of the branchial sac. An imperforate area is in front of the perforated part of the branchial sac. About 12 stigmata are present in each half row. The vas deferens coils eight times around the undivided testis follicle.

**Remarks.** The specimen from Darwin assigned to *Trididemnum savignii* by Kott 2004a (QM G308626) has similar colony, spicules and is the same honey yellow colour as the present holotype and appears to be a synonym. Both specimens differ from *T. savignii* Herdman, 1886 in their yellow colour, lobed colonies, more numerous spicule rays, absence of spicules from the interior of the colony, and the presence of a layer of faecal pellets in the basal test. These colonies are irregular and lobed, but do not form the three-dimensional reticulae of *Trididemnum sibogae*, *Trididemnum tomarahi* C. and F. Monniot, 1987 has smaller spicules than the present species. The six rounded atrial lobes around the aperture are unusually conspicuous for this genus, resembling the branchial lobes, rather than the five pointed papillae around the rim of the atrial aperture in *Leptochniides* spp. Despite its posteriorly orientated atrial siphon the species is readily distinguished from *Leptochniides* spp. by the presence of the retractor muscle as well as its three rows of stigmata and its entire testis follicle.

**Etymology.** The species name is derived from the colony colour in life, *viz.* mellitus, -a, -um, honey coloured.



*Lissoclinnium karenuae* sp. nov.

(Figs 6H; 9C)

**Distribution.** *Type locality:* Solomon Islands (Florida Group – small island E. of Sandfly Passage, under rock, 4–6m, SINM E023, coll. K. Gowlett Holmes, 28 June 2004, holotype QM G308781; paratype SINM E023).

**Description.** The holotype is a tongue-shaped cushion about 2 cm long, salmon-pink and grey on the upper surface. It has a row of four common cloacal apertures ringed with grey owing to especially crowded pigment cells. These apertures are evenly spaced along the centre of the colony. The dark internal test is seen through the common cloacal openings. The colour of the upper surface of the colony is the result of red pigment cells mixed with white spicules in the upper half of the colony. In the preserved specimen, pigment is not present in the solid basal test which appears cream in colour. Otherwise the preserved specimen appears to be the same colour as it was in life. Stellate branchial apertures are evenly spaced on the surface. A vast horizontal common cloacal cavity is in the upper half of the colony and is crossed by the whole length of the zooids, each encased in a strip of test, exposing only almost the whole of the branchial sac.

The spicules are the usual burr-like ones with many rod-like flat-tipped rays, although they are larger than those in most species of this genus, being to 0.065 mm diameter.

**Remarks.** Although gonads were not detected, the species resembles *Lissoclinnium* spp. in its large zooids with an almost rectangular thorax, large common cloacal cavity and burr-shaped spicules. The colony, with conspicuous common cloacal apertures on firm, fleshy rounded branches rather than flat sheets is most like *Lissoclinnium badium* F. and C. Monniot, 1996, as is the dark internal test with pigment cells surrounding the zooids. However, it differs in having spicules almost twice the size of *L. badium*, and also it lacks the yellow pigment present in the latter species.

*Lissoclinnium textile* F. and C. Monniot, 2001 has similar but larger spicules (up to 0.08 mm diameter) and zooids are arranged along each side of circular common cloacal canals, which have brown pigment over them.

**Etymology.** The species is named for Karen Gowlett-Holmes, who collected and photographed the specimens in this collection.

*Lissoclinnium reginum* Kott, 2001

(Fig. 9D)

*Lissoclinnium reginum* Kott, 2001: 319 and synonymy. – Kott 2004b: 65 and synonymy.

**Distribution.** *Previously recorded* (see Kott 2004b): Western Australia (Ashmore Reef, Port Hedland); Queensland (Great Barrier Reef); Northern Territory (Darwin, Bynoe Harbour); Indian Ocean (Cocos Keeling Is). *New record:* Solomon Islands (Russell Group, QM G308784).

**Remarks.** The *in situ* photograph of the newly recorded specimen is purple with white flecks around the common cloacal apertures (Fig. 9D) and closely resembles others previously recorded (Kott 2001: pl. 20c). The spicules are also identical with the burr-shaped spicules formerly described for this and other *Lissoclinnium* spp.

*Diplosoma versicolor* Monniot, 1994

(Fig. 9E)

*Diplosoma versicolor* Monniot, 1994: 9. – Kott 2004b: 67 and synonymy.

**Distribution.** *Previously recorded* (see Kott 2004b): Western Australia (Ashmore Reef, Montebello Island, Houtman's Abrolhos); New South Wales (Lord Howe Island); Queensland (Southern Great Barrier Reef, Townsville, Lizard Island); Northern Territory (Darwin, Bynoe Harbour); Micronesia, New Caledonia, Philippines. *New record:* Solomon Islands (Florida Group, QM G308785, SINM E026). The species has also been recorded from Noosa on the south-eastern coast of Queensland.

**Remarks.** The newly recorded colony of this commonly encountered species is soft, and has patches of whitish bodies (that do not appear to be calcareous) in the black-brown surface test. The yellowish patches present in most specimens of this species are not present, and the colony resembles the black and white specimens reported by F. and C. Monniot (2001).

Family Perophoridae

*Perophora uauaei* Hartmeyer and Michaelsen, 1928

(Fig. 9F)

*Perophora namei* Hartmeyer and Michaelsen, 1928: 270. – Kott 1985: 108 and synonymy; F. and C. Monniot, 2001: 301 (records only).

**Distribution.** *Previously recorded* (see Kott 1985, F. and C. Monniot 2001): Coral Sea, Papua New Guinea, Philippines. *New records:* Solomon Islands (Russell Group, QM G308787-8, SINM E027).

**Remarks.** Once known only from the Philippines, new records of this fragile and beautiful species indicate that it has a wide range in the West Pacific.

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